

The Effect of Support for Action Against the Tobacco Industry on Smoking Among Young Adults

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Smoking initiation is typically characterized as an adolescent behavior,¹ so there are few studies that examine smoking among young adults. However, a substantial portion of the young adult population is at risk for future smoking,² and smoking prevalence among this group was found to be increasing during the late 1990s in several national studies.^{3–5} This increase was felt to be attributable to the aging of adolescents with higher smoking prevalence and increased smoking initiation among young adults.⁵ Young adults are important targets of tobacco advertising and promotional activities.^{6–9} During young adulthood, most people who had experimented with tobacco as adolescents either stop smoking or progress to regular smoking patterns with higher average consumption.^{10,11} The most effective ways to counter tobacco advertising to young adults are not known.

One strategy that has been found to be useful to decrease smoking among adolescents is “tobacco industry denormalization.”^{12,13} This includes media campaigns that educate the public about deceptive tobacco industry practices to motivate action against smoking and to increase the relevance of tobacco issues. This approach, pioneered by the California Department of Health Services,¹⁴ was found to decrease smoking in California,¹⁵ Florida,^{16,17} and nationally.^{18,19} Because denormalization campaigns such as the American Legacy Foundation “truth” campaign focus primarily on adolescents, we examined whether tobacco industry denormalization attitudes were associated with smoking behavior among young adults. If so, this strategy could be expanded to appeal to the young adult age group more strongly. We hypothesized that, similar to what was seen with adolescents, mistrust of the tobacco industry by young adults would increase support of anti-industry efforts, which would, in turn, affect smoking behavior. We examined this relationship, controlling for demographic

Objectives. We investigated associations between tobacco industry denormalization attitudes and the smoking behavior of young adults (aged 18 to 29 years).

Methods. We analyzed data from 9455 young adults in the 2002 California Tobacco Survey.

Results. The data showed that 27.4% of young adults were “ever smokers” (smoked ≥ 100 cigarettes in their lifetime), of whom 66.9% were current smokers (18.3% of young adults). Denormalization attitudes formed 2 major factors: support for anti-tobacco industry action and mistrust of tobacco companies. In multivariate logistic regression, support for action against the tobacco industry was negatively associated with current smoking (odds ratio [OR]=0.16; 95% confidence interval [CI]=0.13, 0.19) and susceptibility to smoking, after we controlled for demographics, exposure to smokers, and advertising receptivity. Mistrust of tobacco companies was associated with smoking behavior, with anti-industry support acting as a mediating variable. Among current smokers, support for anti-tobacco industry action was strongly associated with intentions to quit (OR=4.64; 95% CI=3.15, 6.84) after we controlled for demographics, exposure to smokers, and advertising receptivity.

Conclusions. Support for anti-tobacco industry action protects against smoking and is associated with intentions to quit among young adults. Encouraging involvement in tobacco control and against the tobacco industry may decrease smoking among young adults. (*Am J Public Health.* 2007;97:1449–1456. doi:10.2105/AJPH.2006.098806)

characteristics and exposure to smokers including family members and peers, receptivity to tobacco advertising, and depression, all of which are associated with smoking in both adolescence and young adulthood.^{20–24}

In addition, we present a novel application of previously secret tobacco industry documents—the utilization of secret industry marketing research surveys to help design tobacco countermarketing research. We identified and adapted questions from tobacco market research for a public health survey to see whether these measures could provide additional insights into smoking among young adults that were not identified through standard demographic measures.

METHODS

We used data from the 2002 California Tobacco Survey, a large, population-based, random-digit-dialed survey conducted every

3 years by the University of California San Diego (UCSD) since 1990 for the California State Department of Health as part of the evaluation of the California Tobacco Control Program. The detailed methodology for the survey is described elsewhere.²⁵ We worked with UCSD to develop 57 questions designed to assess determinants of smoking behavior in young adults; the complete questionnaire is available online.²⁵ Data were collected between September 2002 and February 2003 from 9455 young adults (aged 18–29 years), a 58.3% response rate.²⁶

Measures

Smoking behavior. “Ever smokers” were defined as those who reported they had smoked at least 100 cigarettes in their lifetime. “Current smokers” were defined as those who answered that they had smoked at least 100 cigarettes in their lifetime and now smoke cigarettes every day or some days. “Never

smokers” were defined as those who reported they never smoked a cigarette in their lifetime. “Experimenters” reported they had smoked between 1 and 99 cigarettes in their lifetime. Among current smokers, intention to quit smoking was defined as those who responded that they intended to quit smoking within the next 6 months. Among never smokers and experimenters, those who responded with any answer other than “definitely not” when asked, “Do you think you will smoke a cigarette in the next year?” were defined as susceptible to future smoking.

Independent variables. Eight questions used to examine youth attitudes and beliefs toward smoking associated with exposure to the “truth” campaign in the Legacy Media Tracking Surveys¹⁸ were adapted for use in the 2002 California Tobacco Survey. Forty-nine descriptors were adapted from a marketing survey conducted for Philip Morris tobacco company in 1991^{27,28} to define lifestyle and attitudinal segments of the young adult male and female smoking population.^{29,30} The Philip Morris survey instruments, results, data tables, and reports were found by searching previously secret tobacco industry documents; the methods for document searches and results have been described elsewhere.¹¹ During the 1990s, Philip Morris conducted several lifestyle segmentation studies that described different types of smokers in the young adult population.^{30,31} We identified the most complete tables of results and reports from the 1991 segmentation study. We selected 49 items on the basis of their ability to differentiate among segments of the smoking population in the Philip Morris data tables.³²

A smoke exposure score was created by averaging the scores for 4 questions that measured how many of the respondents’ close relatives, close friends, and coworkers (if respondent was employed) smoke (using a 4-point Likert scale). The consistency of this scale, measured with Cronbach’s α with our data, was 0.62.

Depression was measured with a previously validated 6-item self-report scale developed by Kandel and Davies^{33,34} and used on prior California Tobacco Surveys of adolescents. Respondents were asked how often during the past 12 months they had felt too

tired to do things; had trouble going to sleep or staying asleep; felt unhappy, sad, or depressed; felt hopeless about the future; and worried too much about things. Each item was scored on a 4-point Likert scale, and the overall score was obtained by computing the mean across the 6 items. Cronbach’s α for this scale was 0.75.

Advertising receptivity was measured on the index developed by Pierce and Gilpin to study advertising and smoking among adolescents.³⁵ The advertising receptivity index scale was as follows: minimal, respondents could not name a tobacco brand (1 point); low, respondent named a cigarette brand but did not have a favorite brand (2 points); moderate, respondent had a favorite brand but would not use a tobacco promotional item (3 points); high, respondent has a favorite brand and either owns or would use a tobacco promotional item (4 points).

Statistical Analysis

All results were estimated with case-specific sampling weights that allowed estimates to be generalizable to the California population that owns telephones (96% of households).

Exploratory factor analysis and scoring. Because of the large number of independent variables, preliminary factor analyses were performed on attitudes toward tobacco issues and psychographic descriptors of friends to reduce the data. For dichotomous items, factor analyses were performed on matrices of tetrachoric correlation coefficients generated by SPSS version 8.0 (SPSS Inc, Chicago, Ill) using the TETCORR macro.³⁶ Factors with eigenvalues greater than 1 were selected. For each set of questions, scores for each factor were calculated, and logit plots were created to examine whether a linear relationship between these scores and the logit of ever smoking was present. Where the relationship was linear, the variables were treated as continuous predictors in subsequent analyses. If the relationship was not linear, scores were recoded into categorical variables.

Because of practical limitations on the number of questions that could be added to the California Tobacco Survey, we were unable to include all questions that have been used in prior studies of tobacco industry denormalization; we utilized 8 items that were

reported to have strong associations with intention to smoke in the future among adolescents.¹⁸ The factor analysis of the 8 questions that assessed attitudes toward tobacco control issues revealed 2 factors, which were named “support for anti-tobacco industry action” and “mistrust of the tobacco industry.” The factor analysis quantifies the degree of association between each item and its parent factor via the factor loading, which is the standardized regression coefficient of the item regressed onto the latent factor. One item, “smoking makes people your age look cool or fit in” was not associated with either of the 2 factors. The “anti-industry action” scale was created by scoring 1 point for each affirmative answer to the 4 items that made up the first factor (“taking a stand against smoking is important to me,” “I want to be involved with efforts to get rid of cigarette smoking,” “I would like to see cigarette companies go out of business,” and “not smoking is a way to express independence.”) and calculating the mean score. Similarly, the “mistrust of the tobacco industry” scale was created by scoring 1 point for each affirmative answer to the 3 items in the second factor (“cigarette companies lie,” “cigarette companies deny that cigarettes cause disease,” and “cigarette companies deny that cigarettes are addictive.”) and calculating the mean. We summed items to create factor scores with maximum generalizability and consistency.³⁷ The internal consistency of each scale measured by Cronbach’s α exceeded 0.70.

We compared the factor loadings for 49 tobacco industry psychographic items in separate factor analyses conducted among men, women, those who had ever smoked 100 cigarettes (i.e., ever smokers who either were or were not current smokers) and those who had never smoked 100 cigarettes (i.e., never smokers and experimenters). We found the factor structure was similar regardless of gender and smoking status for 14 items that were psychographic descriptors of friends. The exploratory factor analysis of these items yielded 4 factors, which we labeled *rebellious*, *success-oriented*, *cool*, and *adventurous*. Five of the 14 items were not associated with any of the 4 factors. Each time an item that was part of 1 of the 4 factors was chosen as a descriptor of the respondent’s friends, 1 point was

added to the respective scale and the average score was calculated.

Regressions. The relationship between each derived variable, demographic variable, and smoking behavior was examined with bivariate logistic regression. The primary outcome variable was current smoking (smoked at least 100 cigarettes in lifetime and smokes now some days or every day) with all 9455 respondents. For the analysis of the 1685 current smokers in the sample, we used intention to quit as the outcome. We analyzed the 4064 never smokers and the 2684 experimenters who answered the question about future intent to smoke, and we used susceptibility to smoke as the outcome. Predictors with an association with smoking outcomes with $P < .25$ were entered into multivariate logistic regression models.³⁸ In multivariate analyses, predictors with $P > .05$ were eliminated with backward stepwise logistic regression, except for the 4 demographic factors that were forced into all models (age, gender, race/ethnicity, and education).

Structural equation modeling. We examined the relationship between mistrust of the tobacco industry, support for anti-tobacco industry action, advertising receptivity, and smoking behavior with saturated structural equation models to elucidate hypothesized direct and indirect relationships among explanatory and outcome variables. Mistrust of the tobacco industry was significantly negatively associated with current smoking and positively associated with intentions to quit in univariate but not multivariate analyses, so we examined a possible mediating effect for these 2 outcomes. We fitted simple saturated models that examined the direct effects of support for anti-tobacco industry action, mistrust of the tobacco industry, and advertising receptivity on current smoking status, the direct effect of mistrust of the tobacco industry on anti-tobacco industry action, and the direct effect of support for anti-tobacco industry action on current smoking. We also examined the indirect effect of mistrust of the tobacco industry on current smoking, mediated by support for anti-tobacco industry action and advertising receptivity, and the indirect effect of support for anti-tobacco industry action on current smoking, mediated

by advertising receptivity. We fitted a second saturated model that examined the same effects among current smokers only, with intention to quit smoking as the outcome. Weighted least squares with a mean and variance adjustment was used to estimate structural equation model parameters; 95% confidence intervals (CIs) were estimated using the bootstrap method with 5000 bootstrap samples.

Exploratory factor analysis was performed with SPSS version 8.0 (SPSS Inc, Chicago, Ill). Structural equation modeling was performed with Mplus version 4.00 (Muthén and Muthén, Los Angeles, Calif). Logistic regressions were performed with Stata version 9.1 (Stata Corp, College Station, Tex). These latter analyses featured variance estimation using jackknife weights, which necessitated the use of Stata's "svy" survey analysis commands.

RESULTS

The data showed that 27.4% of young adults surveyed had ever smoked 100 cigarettes in their lifetime, and 66.9% of ever smokers were current smokers (18.3% of young adults). Current smoking status was not linearly related to age; age was coded into 3 categories: 18 to 21 years, 22 to 25 years, and 26 to 29 years. Among those aged 18 to 21 years, 16.5% were current smokers; among those aged 22 to 25 years, 21.6% were current smokers; among those aged 26 to 29 years, 17.4% were current smokers. The sample was 64% women, 45% non-Hispanic White, 35% Hispanic, 5% African American, 12% Asian/Pacific Islander, and 4% other race/ethnicity. Most respondents had graduated from high school (58%), were unmarried (74%), and had never smoked 100 cigarettes in their lifetime (73%).

Logistic Regressions

In both univariate and multivariate analyses, support for anti-tobacco industry action was strongly negatively associated with current smoking (odds ratio [OR]=0.16; 95% CI=0.13, 0.19 in multivariate analysis) and susceptibility to smoking (OR=0.24; 95% CI=0.18, 0.31; Table 1). Mistrust of the tobacco industry was negatively associated with current smoking in univariate but not

multivariate analyses. Increasing advertising receptivity, exposure to smokers, and depression were positively associated with current smoking and susceptibility. Rebellious friends were positively associated and success-oriented friends were negatively associated with current smoking and susceptibility to smoking in univariate but not multivariate analyses.

Among current smokers, support for anti-tobacco industry action was strongly positively associated with intentions to quit smoking (OR=4.64; 95% CI=3.15, 6.84). Mistrust of the tobacco industry was associated with quitting intentions in univariate but not multivariate analyses. In both analyses, exposure to smokers was negatively associated with quitting intentions. Social groups, depression, and advertising receptivity were not consistently significantly associated with quitting intentions.

Consistent with prior studies, older age, male gender, less education, and being unmarried were associated with current smoking. Non-Hispanic White race was associated with current smoking; Hispanic ethnicity was associated with greater susceptibility to smoking among never smokers and experimenters. Older age groups were more likely to currently smoke, but older never smokers and experimenters were less susceptible to future smoking. All multivariate models were controlled for age, gender, race/ethnicity, and education; none of these predictors were significantly associated with intention to quit.

Structural Equation Models

We used structural equation modeling to explore the relationships among support for anti-tobacco industry action, mistrust of the tobacco industry, advertising receptivity, and smoking behavior. A prior study has shown that items similar to support for anti-tobacco industry action mediated the relationship between mistrust of the tobacco industry and smoking behavior in adolescents.¹³ A significant mediation relationship could explain why the univariate associations between mistrust of the tobacco industry and smoking behavior would not appear in the multivariate analyses. Structural equation modeling of these factors showed a positive association between mistrust of the tobacco industry and support for

TABLE 1—Determinants of Smoking Behavior in Young Adults (Ages 18–29 Years): California Tobacco Survey, 2002

Variable	All Respondents ^a : Current Smoking (18%)		Among Never Smokers ^b : Susceptible to Smoking (8%)		Among Experimenters ^c : Susceptible to Smoking (40%)		Among Current Smokers ^d : Intent to Quit (50%)	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Support for anti-industry action	0.10 (0.08, 0.12) ^e	0.16 (0.13, 0.19) ^e	0.45 (0.29, 0.70) ^e	0.34 (0.21, 0.57) ^e	0.35 (0.26, 0.46) ^e	0.31 (0.22, 0.44) ^e	5.03 (3.43, 7.37) ^e	4.64 (3.15, 6.84) ^e
Mistrust of tobacco industry	0.55 (0.45, 0.66) ^e	NS	0.73 (0.50, 1.07)	NS	1.06 (0.81, 1.40)	NS	1.79 (1.26, 2.55) ^e	NS
Social groups								
“Rebellious”	3.06 (2.65, 3.55) ^e	NS	1.91 (1.28, 2.85) ^e	NS	1.50 (1.18, 1.92) ^e	NS	0.87 (0.65, 1.16)	NS
“Success-oriented”	0.56 (0.46, 0.66) ^e		0.47 (0.28, 0.81) ^e		0.63 (0.45, 0.87) ^e		1.15 (0.78, 1.68)	
“Cool”	1.50 (1.26, 1.77) ^e		0.91 (0.61, 1.36)		1.42 (1.15, 1.74)		0.90 (0.65, 1.25)	
“Adventurous”	1.63 (1.34, 1.97) ^e		1.30 (0.87, 1.93)		1.19 (0.90, 1.56)		0.85 (0.59, 1.22)	
Exposure to smokers	7.30 (6.39, 8.34) ^e	5.30 (4.46, 6.29) ^e	2.01 (1.48, 2.75) ^e	1.75 (1.26, 2.44) ^e	2.09 (1.65, 2.63) ^e	1.74 (1.32, 2.29) ^e	0.57 (0.42, 0.77) ^e	0.62 (0.46, 0.83) ^e
Depression	1.71 (1.53, 1.92) ^e	1.61 (1.38, 1.88) ^e	1.31 (1.01, 1.69) ^e	1.32 (1.02, 1.73) ^e	1.13 (0.97, 1.32)	NS	1.09 (0.93, 1.27)	NS
Advertising receptivity								
Minimal	1.00 ^{e,f}	1.00 ^{e,f}	1.00	NS	1.00 ^{e,f}	1.00 ^{e,f}	1.00 ^{e,f}	1.00 ^{e,f}
Low	1.38 (1.05, 1.81) ^e	1.20 (0.88, 1.64)	1.11 (0.74, 1.66)		1.51 (1.06, 2.15) ^e	1.41 (0.98, 2.04)	2.6 (1.38, 4.92) ^e	2.42 (1.33, 4.41) ^e
Moderate	3.59 (2.81, 4.57) ^e	2.43 (1.85, 3.19) ^e	1.37 (0.90, 2.08)		2.04 (1.46, 2.85) ^e	1.79 (1.22, 2.63) ^e	1.67 (0.98, 2.80)	1.53 (0.87, 2.67)
High	8.25 (6.31, 10.79) ^e	3.10 (2.26, 4.25) ^e	1.60 (1.01, 2.54) ^e		2.51 (1.80, 3.50) ^e	1.90 (1.29, 2.78) ^e	1.02 (0.58, 1.79)	1.17 (0.67, 2.03)
Age, y								
18–21	1.00 ^{e,f}	1.00 ^{e,f}	1.00 ^{e,f}	1.00 ^{e,f}	1.00 ^{e,f}	1.00 ^{e,f}	1.00	1.00
22–25	1.40 (1.20, 1.63) ^e	1.75 (1.43, 2.15) ^e	0.42 (0.29, 0.60) ^e	0.43 (0.29, 0.65) ^e	0.64 (0.51, 0.81) ^e	0.68 (0.51, 0.89) ^e	0.93 (0.69, 1.27)	0.83 (0.62, 1.14)
26–29	1.07 (0.92, 1.24)	1.57 (1.29, 1.90) ^e	0.23 (0.14, 0.36) ^e	0.20 (0.12, 0.34) ^e	0.37 (0.29, 0.47) ^e	0.48 (0.35, 0.65) ^e	0.96 (0.69, 1.23)	0.79 (0.57, 1.09)
Male gender	2.01 (1.76, 2.29) ^e	1.36 (1.14, 1.62) ^e	1.32 (0.97, 1.78)	1.06 (0.71, 1.57)	1.35 (1.12, 1.64) ^e	1.09 (0.89, 1.35)	0.93 (0.73, 1.17)	0.90 (0.69, 1.17)
Race/ethnicity								
White	1.00 ^{e,f}	1.00 ^{e,f}	1.00 ^{e,f}	1.00 ^{e,f}	1.00	1.00 ^{e,f}	1.00	1.00
Hispanic	0.54 (0.45, 0.65) ^e	0.67 (0.53, 0.86) ^e	1.99 (1.50, 2.65) ^e	2.37 (1.67, 3.36) ^e	1.36 (1.10, 1.68) ^e	1.63 (1.25, 2.12) ^e	1.57 (1.15, 2.13)	1.31 (0.96, 1.78)
African American	0.60 (0.44, 0.83) ^e	0.54 (0.34, 0.85) ^e	1.01 (0.54, 1.88)	0.84 (0.40, 1.76)	1.03 (0.66, 1.61)	1.06 (0.63, 1.79)	1.55 (1.91, 2.62)	1.24 (0.70, 2.18)
Asian/Pacific Islander	0.51 (0.42, 0.63) ^e	0.55 (0.40, 0.75) ^e	1.62 (1.07, 2.45) ^e	1.57 (1.00, 2.46)	1.01 (0.74, 1.40)	0.97 (0.68, 1.37)	1.21 (0.84, 1.77)	1.08 (0.70, 1.67)
Other	1.11 (0.81, 1.52)	0.91 (0.61, 1.36)	2.77 (1.07, 7.17) ^e	2.83 (1.07, 7.49) ^e	1.11 (0.62, 2.00)	1.09 (0.58, 2.05)	0.98 (0.54, 1.75)	1.00 (0.49, 2.06)
More than high-school education	0.72 (0.64, 0.82) ^e	0.61 (0.50, 0.73) ^e	0.54 (0.41, 0.73) ^e	0.68 (0.47, 0.99) ^e	0.81 (0.69, 0.95) ^e	0.98 (0.78, 1.22)	1.06 (0.85, 1.31)	1.15 (0.88, 1.51)
Married	0.58 (0.49, 0.70) ^e	0.68 (0.55, 0.85) ^e	0.41 (0.27, 0.61) ^e	NS	0.40 (0.32, 0.51) ^e	0.52 (0.40, 0.70) ^e	1.23 (0.92, 1.66)	
Currently employed	1.47 (1.27, 1.69) ^e	NS	0.83 (0.61, 1.14)	NS	1.01 (0.81, 1.26)	NS	1.12 (0.87, 1.44)	

Notes. OR = odds ratio; CI = confidence interval; NS = not significant. Only variables with $P < .05$ in multivariate analyses are shown, except for the demographic variables forced into all models: age, gender, race/ethnicity, and education. For information on how variables were scored, see “Methods” section.

^aN ranged from 8148 to 9455 for univariate analyses; n = 7920 for multivariate analysis because of different numbers of available cases.

^bNever smokers were defined as those who had never smoked a cigarette in their lifetime. N ranged from 3384 to 4064 for univariate analyses; n = 3376 for multivariate analysis because of different numbers of available cases.

^cExperimenters were defined as those who had smoked between 1 and 99 cigarettes in their lifetime. N ranged from 2407 to 2684 for univariate analyses; n = 2707 for multivariate analysis because of different numbers of available cases.

^dCurrent smokers were defined as those who had smoked at least 100 cigarettes in their lifetime and currently smoke cigarettes every day or some days. N ranged from 1504 to 1685 for univariate analyses; n = 1479 for multivariate analysis because of different numbers of available cases.

^e $P < .05$ for single-degree-of-freedom tests.

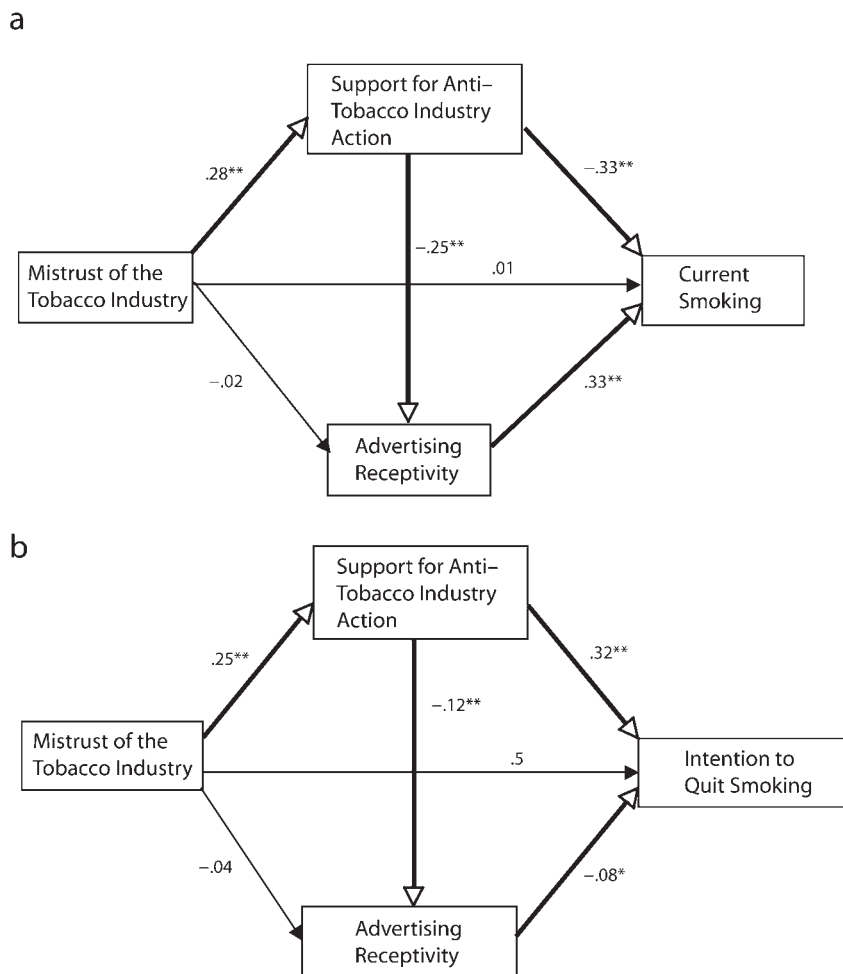
^f $P < .05$ for the multiple-degree-of-freedom Wald test of overall differences for categorical variables.

anti-tobacco industry action, and a negative association between support for anti-tobacco industry action and advertising receptivity. As expected, advertising receptivity was significantly positively associated with current smoking and negatively associated with intention to

quit, whereas support for anti-tobacco industry action was negatively associated with current smoking and positively associated with intention to quit (Figure 1, Table 2).

Mistrust of the tobacco industry was not directly associated with advertising receptivity,

nor was it directly associated with either current smoking or intent to quit. There was, however, a significant negative indirect association between mistrust of the tobacco industry and current smoking that was sequentially mediated by support for anti-tobacco



Note. Thick lines denote significant effects; thin lines denote nonsignificance. Mistrust of the tobacco industry increased support for anti-tobacco industry action directly. Support for anti-tobacco industry action affected smoking behavior directly and affected smoking behavior indirectly by reducing advertising receptivity. For information on how variables were measured, see "Methods" section. Coefficients are direct standardized regression weights. * $P < .05$; ** $P < .001$.

FIGURE 1—Structural equation models of mistrust of the tobacco industry, support for anti-tobacco industry action, and advertising receptivity on the outcome of current smoking among all respondents (a) and the outcome of the intention to quit smoking among current smokers (b).

industry action and advertising receptivity (unstandardized estimate = -0.078 ; 95% CI = $-0.090, -0.067$; standardized estimate = -0.022), and there was a significant negative indirect association between mistrust of the tobacco industry and current smoking mediated by support for anti-tobacco industry action alone (unstandardized estimate = -0.319 ; 95% CI = $-0.357, -0.284$; standardized estimate = -0.091). There was a significant indirect negative association

between support for anti-tobacco industry action and current smoking mediated by advertising receptivity (unstandardized estimate = -0.273 ; 95% CI = $-0.310, -0.239$; standardized estimate = -0.080).

Similarly, there was a significant indirect association between mistrust of the tobacco industry and intent to quit that was sequentially mediated by support for anti-tobacco industry action and advertising receptivity (unstandardized estimate = 0.007 ; 95% CI = $0.002,$

0.015 ; standardized estimate = 0.002), and there was a significant indirect association between mistrust of the tobacco industry and intent to quit mediated by support for anti-tobacco industry action alone (unstandardized estimate = 0.238 ; 95% CI = $0.183, 0.306$; standardized estimate = 0.082). There was no significant indirect effect of mistrust of the tobacco industry on intent to quit mediated by advertising receptivity alone. Thus, as among youths,¹³ increasing mistrust of the tobacco industry contributes to lower smoking among young adults.

DISCUSSION

Among young adults, support for anti-tobacco industry action, as reflected in the 4 attitude statements, "Taking a stand against smoking is important to me," "I would like to see cigarette companies go out of business," "I want to be involved with efforts to get rid of cigarette smoking," and "Not smoking is a way to express independence," had strong negative associations with current smoking as well as with susceptibility to future smoking. It was also the only predictor variable significantly positively associated with intention to quit smoking among current smokers in multivariate analyses. All 4 of these attitude statements have been shown to be strongly negatively associated with intentions to smoke among those aged 12 to 17 years,¹⁸ and 3 of the 4 statements (all except "I would like to see cigarette companies go out of business") were also found to be strongly associated with exposure to the national "truth" campaign.¹⁸ Tobacco industry denormalization campaigns have been shown to decrease smoking among adolescents in several studies.^{12,16,39–41} These results suggest that similar anti-tobacco industry attitudes and a greater willingness to take action against smoking and the tobacco industry are also associated with decreased smoking among young adults.

The factor that reflected mistrust of the tobacco industry had a significant indirect association with smoking behavior that was mediated by support for anti-tobacco industry action. The mistrust of the tobacco industry and support for anti-tobacco industry action factors used in our scales are very similar

TABLE 2—Structural Equation Models in Study of Young Adults (Ages 18–29 Years): California Tobacco Survey, 2002

Independent Variables	Unstandardized Direct Effect on Support for Anti-tobacco Industry Action (95% CI)	Unstandardized Direct Effect on Advertising Receptivity (95% CI)	Unstandardized Direct Effect on Smoking Behavior (95% CI)
Among all respondents, outcome:			
current smoking ^a			
Mistrust of tobacco industry	0.29 (0.26, 0.31)*	-0.06 (-0.13, 0.001)	0.03 (-0.07, 0.12)
Support for anti-tobacco industry action		-0.74 (-0.80, -0.68)*	-1.12 (-1.22, -1.02)*
Advertising receptivity			0.37 (0.33, 0.41)*
Among current smokers, ^a outcome:			
intention to quit smoking			
Mistrust of tobacco industry	0.25 (0.21, 0.29)*	-0.10 (-0.23, 0.03)	0.13 (-0.04, 0.32)
Support for anti-tobacco industry action		-0.29 (-0.42, -0.17)*	0.94 (0.76, 1.13)*
Advertising receptivity			-0.09 (-0.16, -0.03)*

Note. CI = confidence interval. For information on how variables were scored, see “Methods” section.

^aCurrent smokers were defined as those who had smoked at least 100 cigarettes in their lifetime and currently smoke cigarettes every day or some days.

* $P < .05$.

although not identical to the “industry beliefs” and “industry attitudes” Hersey et al.¹³ identified in their study of adolescents. Our data are consistent with the basic structure of Hersey’s model, in which support for anti-tobacco industry action mediated the relationship between mistrust of the tobacco industry and smoking behavior, and advertising receptivity partially mediated the relationship between support for anti-tobacco industry action and smoking behavior.

Our study adds to the prior literature, which has been limited to adolescents, and suggests that antitobacco attitudes supported by advocacy interventions are associated with smoking behavior among young adults. These results suggest that industry denormalization campaigns may function by first educating the public about the deceptive practices of the tobacco industry, and that mistrust of the tobacco industry is in turn associated with beliefs that taking a stand against smoking is important, the desire to take part in tobacco control efforts, and reduced receptivity to tobacco advertising. The advocacy intervention strategy has been shown to reduce smoking among high-school students.⁴²

Consistent with other studies of smoking behavior among young adults,^{20,43} we found that exposure to smokers (family members, friends, coworkers, and social contacts) was strongly

associated with smoking behavior. Although peer pressure is often considered an important factor in smoking initiation among adolescents, young adults are also affected by exposure to smokers in their homes and workplaces. This vulnerability is exploited by tobacco industry efforts to create smoker-friendly social environments through promotional activities targeted to young adults.^{6–9,11,24,44} Exposure to smokers was the only variable significantly negatively associated with intentions to quit among current smokers. These data suggest that young adult homes, workplaces, and social environments are also important venues for public health interventions to decrease smoking uptake and to promote cessation.

Our results also suggest that young adults may continue to be vulnerable to the effects of tobacco advertising, even in a California population with extensive exposure to antitobacco advertising campaigns. Higher levels of receptivity to tobacco advertising were associated with current smoking and increased susceptibility to smoking among experimenters. We did not find an association with susceptibility among never smokers, which suggested that tobacco advertising in this age group may encourage continued smoking among experimenters more than it may stimulate never smokers to take their first puff. Advertising restrictions, such as those in the 1998 Master

Settlement Agreement, contain loopholes that allow advertising in “adults-only” venues. There is evidence that attendance at “adults-only” promotional events is associated with smoking behavior among young adults.⁷ Policies focused only on restricting tobacco advertising and promotion to adolescents aged younger than 18 years will allow the smoking epidemic to propagate through advertising to young adults.

This is the first study to utilize measures adapted from tobacco industry documents in a public health study of smoking behavior among young adults. Because most of the psychographic items’ factor structure varied by gender and smoking status, it was not appropriate to include all 57 items in this analysis. The limited set of 14 items utilized in this analysis was not significantly associated with smoking behavior in multivariate logistic regressions. These items are probably better utilized in combination with the other psychographic measures in cluster analyses separated by gender, analogous to the tobacco industry market research studies from which they were adapted. The methods piloted here represent an innovation in the use of tobacco industry documents, which have previously been used primarily in descriptive analyses. Public health practitioners should consider reviewing tobacco industry documents for surveys and other market research tools that may be informative when developing new surveys of special populations, such as young adults, in which the tobacco industry has had a long-standing interest. Although beyond the scope of the present study, market research survey instruments can be used to perform segmentation studies analogous to tobacco industry studies to identify segments of young adults most vulnerable to tobacco advertising and most receptive to antitobacco messages.

Limitations

The study results are limited to the young adult population in California, which has a well-established tobacco control program that includes a media campaign with strong tobacco industry denormalization messages. The strength of support for anti-tobacco industry action in this population may not be generalizable to other populations. The 58% response rate also suggests that the results may not be generalizable to all young

adults. Nonetheless, this is one of the largest population-based surveys of young adults and smoking conducted to date, and the study design, sampling frame, and weighting are of high quality. The smaller sample size of the current smoking subgroup may have limited our ability to detect significant associations with intent to quit. The study is limited by its cross-sectional design; the observed associations do not prove causality between the measured attitudes and smoking behavior. The strength of the association between support for anti-tobacco industry action and smoking behavior we observed is consistent with similar results from controlled quasi-experimental and repeated cross-sectional studies of adolescents.^{19,45,46} The study does not directly measure exposure to denormalization antitobacco media campaigns, although California's antitobacco media campaign includes denormalization messages. It does, however, provide evidence of a strong association between denormalization attitudes and smoking behavior.

Conclusion

We demonstrated a strong relationship between attitudes that reflected support for tobacco-control activities and smoking behavior among young adults. Strong denormalization media campaigns, such as the California Department of Health Services and "truth" media campaigns, that reinforce these attitudes may decrease smoking behavior among young adults in addition to the positive effect they have on smoking among adolescents. Although the American Legacy Foundation considers young adults to be an important secondary audience for the "truth" campaign, other media campaigns that focus on adolescents may not be properly designed or placed to reach young adults. It would be more cost-effective to design campaigns that appeal to both young adults and adolescents and place these advertisements in a way that would reach both audiences. ■

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This article was accepted March 6, 2007.

Contributions

P.M. Ling and S.A. Glantz originated and designed the study and obtained funding. P.M. Ling also wrote the first draft of the article. All authors contributed to the analysis and interpretation of the data and the review, revision, and approval of the final article.

Acknowledgments

This work was supported by National Cancer Institute (grant CA-87472) and the Flight Attendant Medical Research Institute.

The authors wish to thank John Pierce and Betsy Gilpin for including items from tobacco industry documents in the 2002 California Tobacco Survey.

Note. The findings and views contained in this study are those of the authors and do not represent those of the funding agencies.

Human Participant Protection

This study was approved by the Committee on Human Research at the University of California, San Francisco.

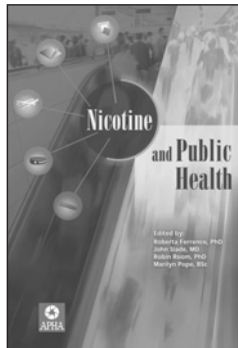
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